

An Instructional Video Module on Spreadsheets Accommodating the Needs of Senior Citizens

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Abstract: An increasing number of senior citizens are motivated to learn how to use computers to make everyday tasks more effective and efficient. However, due to changes that occur with aging, they require specific accommodations to satisfy their learning deficits and needs. Much computer instruction is provided for the younger generation, but the older generation also deserves fair opportunities to reap the benefits of technology. Video has the potential to successfully transfer step-by-step instructions for completing computer-based tasks through visual, audio, and interactive capabilities. Therefore, the purpose of this instructional design study was to develop a video module for creating a basic table and chart using Google Docs spreadsheets, a valuable tool for managing data. The video module's effectiveness on supporting senior citizen understanding and learning of the steps was evaluated. The subjects were 12 senior citizens, 55-years and older, with no experience using spreadsheets. Data collection tools included pre- and post-tests, and attitudinal and demographic surveys. Results suggest that the video module integrating specific accommodations for older adult learners was effective in delivering instruction.

Introduction

The old adage, "You can't teach an old dog new tricks," is untenable. This mission may not be simple to accomplish, but it can be done by integrating specific pedagogical strategies that align with learning needs related to aging and the challenges linked to taking on new endeavors. In today's world, technological advances are the new tricks of society, but chronologically mature individuals usually are not associated with technological opportunities. This problem can be remedied through positive experiences when considerations to support their deficits are integrated within the instruction. Digital immigrants, classified as those who were born before 1980, did not grow up with technology assisting everyday duties, as much of today's younger generation, the digital natives, have been able to experience (Prensky, 2001). Consequently, to the older generation of adults who make-up a large percent of the digital immigrants, modern life is an entirely new world when compared to the environment they grew up in; learning computers comes along with a new set of terminology, skills, and changes in life's everyday routines (Selwyn, Gorard, & Furlong, 2003). Society has the responsibility to provide appropriate pedagogical tools to teach digital immigrants how to be functional, rhetorical, and critical users of technology (Selber, 2004). Without providing accessible education geared towards older adults, this generation is not given fair opportunity to

utilize, enjoy, and maximize the wonders of technology.

Literature Review

With the rapid expansion of technology geared towards making everyday tasks more efficient, effective, and convenient, there are a growing number of older adults who have the desire to obtain computer skills (Selwyn et al., 2003). The motivation to learn computers include, “enhancing communication, searching for information, remaining active, and learning for pleasure” (Mayhorn, Stronge, McLaughlin, & Rogers, 2004, p. 190). This implies that the older generation strives to maintain independence, and places importance on remaining active members of society. Additionally, as the number of older adult users increase, computers are becoming more accessible: community and day centers, coffee shops, shopping centers, stores, nursing homes, libraries, relatives’ homes, and even purchasing of personal devices (Selwyn et al., 2003).

Nevertheless, many older adults find that becoming part of the technologically savvy generation is a challenge. Changes in perceptual senses, motor functions, and cognitive capabilities that develop with age affect the technological abilities and attitudes of older adults (Mayhorn et al., 2004). These changes can be attributed to a number of factors: stress, fatigue, illnesses, side effects of medicines, the decline of senses, and others (U.S. Department of Health and Human Services, n.d.). Reduced visual acuity leads to difficulty in seeing smaller objects and focusing on objects, which can be accommodated by providing large text and images (Selwyn et al., 2003). To support the decreased sense of hearing, audio must be clear, slowed, and have adjustable volumes. For the decline in motor functions, mouse settings can be adjusted and keyboard shortcuts can be used, in addition to using device alternatives, such as touch pads, touch screens, and roll balls (Mayhorn et al., 2004). Cognitive changes, including hindered processing speeds, attentiveness, and retention, is another issue linked to aging (Mayhorn et al., 2004). The material should be broken-up into digestible chunks, and concise, simple language should be used (U.S. Department of Health and Human Services, n.d.). Retention can be assisted through repetition and emphasizing of important details. Frequent review and practice are also necessary to reinforce the content, assist in memory functions, and ultimately to encourage “. . . new skills to become automatic” (Bean & Laven, 2003, p. 5).

Not to mention, older adults are often reluctant to learn about and use computers, as it encompasses new knowledge, skills, and habits that take time to understand and to become comfortable with (Selwyn et al., 2003). Mayhorn et al. (2004) summarize, “Factors such as previous computer experience, computer anxiety, and perceived usefulness may interact to influence the development of older adults’ attitudes towards computers” (p. 192); therefore, it is important for senior citizens to experience successful encounters using computers related to tasks that are interesting and relevant to their lives.

Older adults benefit from the combination of visual and audio instruction in learning procedural tasks, which can be satisfied through instructional videos (Lin & Hsieh, 2006). Wright and Belt (2001) report, “Adding graphics showing the actions to be performed might compensate for language impairments [of older adults], especially if the

graphics are animated and synchronized with verbal instructions” (p. 60). Most videos also allow learners to control the pace of instruction by playing, pausing, rewinding, or fast-forwarding the content to meet their needs. Finally, opportunities for interaction can be integrated within video, and is essential to support deeper learning and understanding (Lam, 2005; Surprise & Mitchell, 1994). Due to video capabilities that transfer information through various modes, this tool has the potential to make learning experiences for older learners more effective and efficient (Lin & Hsieh, 2006).

Methodology

Purpose of the instructional design project. The purpose of this instructional design project was to develop a video module that incorporated specific accommodations for senior citizen learners, featuring an introduction to spreadsheets. Evaluation of the effectiveness of the video segments in promoting successful understanding of the steps for creating a basic table and chart in Google Docs was conducted with older adult computer users on Oahu.

Design of the instructional video module. Various tools were used throughout the creation of the video module. Keynote was used to create the title slides for the different sections, as well as for the background information about spreadsheets presented at the beginning of the module. Google Docs was the featured spreadsheet program used in this instruction, as it is free and accessible as long as Internet connection is available. Finally, iShowU recorded the on-screen computer actions, and iWeb was used to create the website on which the links to each video segment and practice activity was housed.

This video-based instructional module consisted of on-screen action recordings with synchronized narration. Specific considerations to support the transfer of information to older adult learners were featured: an enlarged mouse-arrow with a yellow transparent “flashlight” following its movement, enlarged text, slowed speech, verbal repetition to emphasize important points, simple language, practice questions with feedback, and appropriately-sized “chunks” of information. In addition, the learners were allowed to control the pace of the instruction. The website’s style was simple, avoiding bells and whistles. The layout consisted of contrasting colors of white text on a black background. Sans-serif fonts size 25 point or larger were used to promote legibility and readability. A navigation menu on the left side of every page was consistent in appearance and placement.

The “ADDIE” model (Gagne, Wager, Golas, & Keller, 2005), a systematic design consisting of five phases: analysis, design, development, implementation, and evaluation, was used as a guide to ensure optimal creation of the learning event. The required objectives were observable and measurable in order to reach the terminal objective, which read, “The senior citizen computer user will demonstrate the ability to create a basic table and chart using the Google Docs spreadsheet program.” In total, there were five entry-level (EL) objectives and seventeen main objectives.

The instruction was constructed in a linear fashion. The learners were required to

successfully accomplish the steps in sequence, as each built upon the preceding. However, the provided navigation menu on all the pages allowed for skipping chapters and steps in cases where it was appropriate to do so. The information in each short video was chunked according to concept or step. Embedded multiple-choice practice activities with instant feedback were provided throughout the module for checking understanding and reinforcing learning. All in all, the instruction included Gagne's Nine Events of Instruction (Gagne et al., 2005), which cover nine processes that must be activated in order for effective learning to take place.

The "Home" page explained the purpose of the website and stated prompts for getting started. (See Figure 1). The "Introduction" page housed the overview video of the module describing the featured main concepts. Then, the four chapters each were given a separate page, which included a link to the informational video, a link to the practice activity, and a link to move on to the next chapter's page. Chapter 1 covered basic information about what spreadsheets are; Chapter 2 covered common tasks that spreadsheets are used for; Chapter 3 covered the basic parts of a spreadsheet; Chapter 4 included the steps required to create a basic table and chart using the Google Docs spreadsheet program.

Procedures. The 12 subjects for this research project were senior citizen computer users, ranging in age from 56 to 73-years old with no prior experience using spreadsheets. They were asked to complete a series of tasks that allowed the researcher to gather necessary data to test the effectiveness of the instructional video module. First, to determine if the participants possessed the EL skills and to assess their prior knowledge about the task, they were mailed or hand-delivered a paper-based, predominately multiple choice pre-test with 22 questions.

The main testing took place on three different dates at a home residence equipped with two PC desktop computers and two PC laptop computers. Headphones and external mice were provided. The participants progressed through the instructional video module independently and participated in the embedded practice activities, which were designed to take about one hour in total. Immediately upon completion of the module, they each took a paper-based, predominately multiple choice post-test with 17 questions to assess their learning from the video module. Next, they individually filled-out an attitudinal survey with 20 Likert Scale questions broken-up into the categories of "Instructional Delivery of the Video Module," "Content of the Video Module," and "Organization of the Website." Three open-ended questions were provided to solicit detailed feedback and comments. Finally, every participant was given a 16-question open-ended demographic survey for collecting relevant personal background information to guide the establishment of conclusions.

Results

The pre-test scores indicated that the participants initially lacked in-depth knowledge required to meet the terminal objective. Nonetheless, they managed to score an average of 100% on Objective 4, which asked them to identify cells according to their cell addresses, but received low scores for the objectives pertaining to the actual procedures.



Figure 1. Screenshot of the "home" page.

(See Figure 2). The participants' average on the pre- and post-tests for the item related to Objective 4 remained constant at 100%, indicating that this concept could have been an EL objective instead, and eliminated from the instruction.

The participants significantly improved on the post-test as compared to the pre-test, with the exception of a couple anomalies. Although the post-test average for Objective 5's test item relating to retrieving the Google Doc's website improved, it was low at 67%. After close examination, the researcher concluded a potential reason for this anomaly. The test question read, "http://www.docs.google.com is the URL address for which website?" Participants selected the answer option, "Doc's Google," 33% of the time due to the

syntactic arrangement of the URL's domain name, instead of the correct answer, "Google Docs."

For Objective 8, "name and save the spreadsheet," the pre-test average, 75%, was higher than the post-test average, 67%, which could have been due to the mismatch in difficulty of the particular questions on each test. In the pre-test, the participants were asked to identify the process "to name and save a spreadsheet in Google Docs." Only one of the answer options included the term "save," thus most participants selected this answer. In the post-test, the participants were asked to identify what happens after clicking the "save" button, which may have been slightly more complex of a concept to remember as compared to the pre-test question. Four out of twelve participants answered this test item incorrectly, all selecting the answer, "options to save the spreadsheet "now" or "upon completion" are offered." These participants were probably unsure of the correct answer, but because the main concept of this test item was about "saving" the spreadsheet, they selected the only answer option with the term "save" in it.

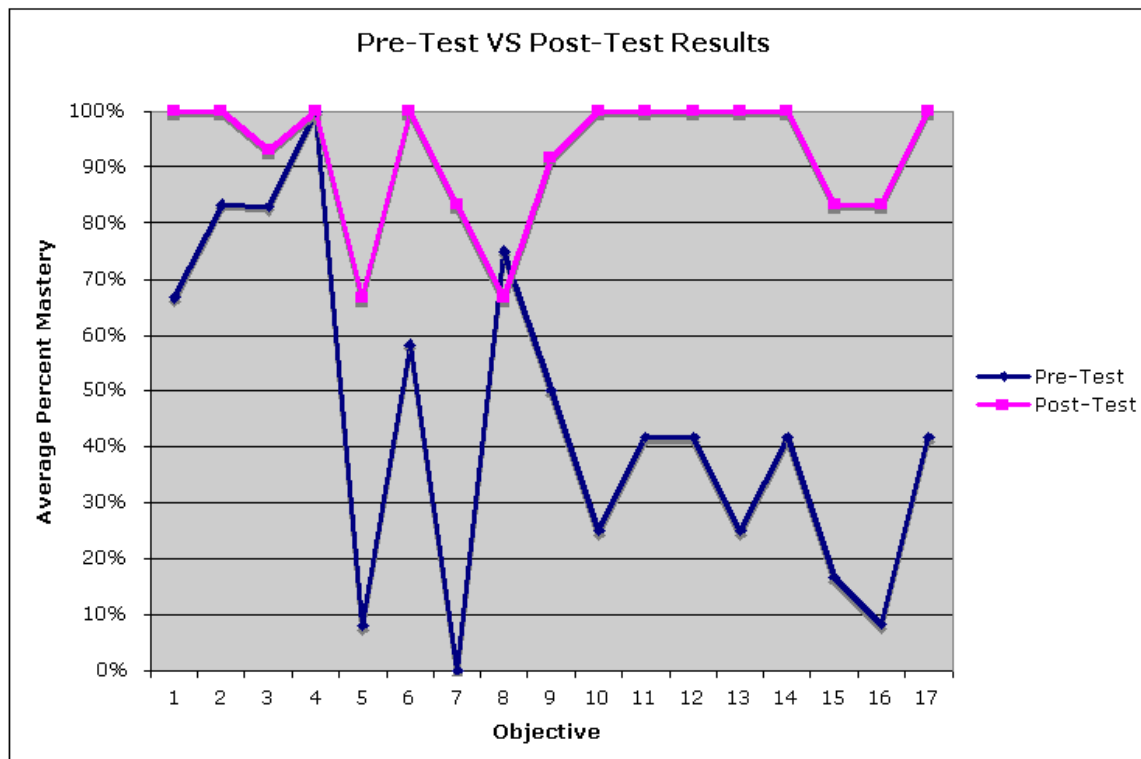


Figure 2. Pre-test versus post-test percent mastery results according to objective.

In summary, the average score for the pre-test was 45% and the post-test was 92%, suggesting that the instructional video module was effective in meeting its goal of delivering step-by-step instructions to older computer learners. There was a 47% increase between tests indicating that significant learning occurred from the instruction. Success on the culminating post-test could have been partially attributed to the immediacy of the test being administered upon completion of the video module. Furthermore, according to the post-test data, there were no significant differences between the participants who completed the module on the desktop computers as compared to on the laptops.

Attitudinal survey data. On the whole, the attitudinal survey responses illustrated that the participants found video to be an effective means of informational delivery. (See Figure 3). All of the Likert survey statements were formatted in positive terms to avoid confusion. No participant rated any statement with “strongly disagree.” In fact, 100% of the participants “strongly agreed” that the steps shown through the on-screen action recordings were easier to follow as compared to if the steps were written out, and that the synchronized audio narration was helpful to their understanding.

The participants claimed that the specific accommodations that were integrated for senior learners were generally helpful. Most of the criteria covering these particular pedagogical strategies were rated at least an average of 90% or higher in terms of being helpful in understanding the instruction. However, the statement, “The visuals were easy to see,” was rated 85% as a low. A few participants claimed that the icons on the tool bar were slightly small, and thus, required more effort and focus in order to be seen adequately.

The statement, “The length of the video instructional module was “just right,”” received 73%, the lowest average altogether. Only 17% of the participants “strongly agreed,” while 50% of the participants “agreed.” The remaining 33% felt “neutral” or even “disagreed.” Consequently, these results revealed that the length of the video module was appropriate for the most part, but may have been slightly too tedious to get through in one sitting for older adults.

Moreover, presenting the module on a website proved to be overall effective for senior citizen learners. The participants rated the aesthetics of the website, including the size of the text, at least 92% effective. The participants added that the colors of the website were appropriate and easy to look at. The ease of knowing what to do and navigating through the website were each rated an average of 88%. Though directions were stated after every video to “close this window and return to the website to proceed,” a few of the participants needed reassurance from the researcher.

The majority shared that the most beneficial aspect about learning through video was the ability to see the steps being demonstrated, what the icons and buttons looked like, and where items were located on the screen. They also found value in the verbal explanations, along with the ability to re-watch sections of the video as necessary. Least beneficially, most of the participants claimed that they were unable to ask questions; consequently, 25% shared that they would learn better through face-to-face training. A few suggested that a hands-on opportunity to follow along and apply the steps would have been beneficial.

Generally, although the participants demonstrated that they understood the steps required to complete a basic table and chart using the Google Docs spreadsheet program, the statement, “With the support of this video module on-hand, I think I would be able to create the demonstrated table and chart using the Google Docs spreadsheet program,” was rated an average of 82%. This outcome can be attributed to the lack of hands-on experience that the participants had with spreadsheets. After all, confidence and adequate skills to successfully use spreadsheets can be developed through practice.

Statement	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree	Overall Percent Rating
<i>Instructional Delivery of the Video Module</i>					
Length of video module was "just right"	17%	17%	50%	17%	73%
Steps appropriately broken-up into digestible "chunks"	0%	0%	50%	50%	90%
Watching on-screen action recordings were helpful to my understanding	0%	0%	17%	83%	97%
Steps shown through on-screen action recordings were easier to follow as compared to if written out	0%	0%	0%	100%	100%
Visuals were easy to see	8%	17%	17%	58%	85%
Yellow "flashlight" feature helped me follow mouse's arrow/focus on area of screen	8%	0%	0%	92%	95%
Audio narration synchronized with action recordings was helpful to my understanding	0%	0%	0%	100%	100%
Narrator spoke at an appropriate pace	0%	0%	17%	83%	97%
Terminology and language used was easy to understand	0%	0%	25%	75%	95%
Capability to re-watch videos and control them by was helpful	0%	8%	17%	75%	93%
"Practice Activity" questions with feedback helped my understanding and learning	0%	0%	42%	58%	92%
<i>Content of the Video Module</i>					
Introduction clearly explained what learner will learn	0%	0%	8%	92%	98%
I now have a better understanding of what spreadsheets are	0%	0%	17%	83%	97%
I now have a better understanding of what spreadsheets are used for	0%	0%	17%	83%	97%
With support of this video module on-hand, I would be able to create the demonstrated table and chart using Google Docs spreadsheet program	0%	25%	42%	33%	82%
Steps built upon one another in logical manner	0%	0%	8%	92%	98%
<i>Organization of the Website</i>					
Website's appearance was aesthetically pleasing	0%	0%	25%	75%	95%
Text was large enough to read	0%	8%	25%	67%	92%
Easy to navigate through website	0%	0%	58%	42%	88%
Easy to understand what to do on website	0%	0%	58%	42%	88%

Figure 3. Attitudinal survey Likert Scale overall percent ratings.

Discussion & Implications

Based on the results of this instructional design project, video is an effective method for delivering instruction on spreadsheets to senior citizen learners. Visuals synchronized

with audio narration complement one another and help with older adults' understanding, especially when the focus is on a new program or task. Nevertheless, this study showed that in order for this instructional strategy to be most advantageous for older adults, specific design considerations must be integrated.

Enlarged visuals, including text and images, are necessary to ensure that the learners are able to see the content. Likewise, contrasting colors that are not too bright for sensitive eyes, such as white on black, as well as font choice that is large and plain are important to achieve readability and visibility. Narration is most effective when simple terminology is used, and the speech is slowed, clear, and adjustable in volume to achieve audibility. Due to hesitation that older adults tend to possess towards technology, clearly identified buttons or steps that indicate how to proceed through the instruction is optimal. To support reinforcement and retention of the main concepts, practice activities or opportunities to allow the learners to check their understanding are imperative.

Furthermore, results showed that simplicity is key to effective instruction for older adults. The less cluttered the design of the instruction is, the more effective it will be; a clean design will allow the learners to automatically place more focus towards the essential content. In other words, extraneous elements to make the instruction fancier can actually be detrimental to the learning of senior citizens. The layout is most adequate when the various sections are clearly identified by separate divisions. Additionally, consistency of the design is ideal for ease in navigating through the instruction. Not to mention, minimal scrolling demands of the learners should be considered due to the decline in motor functions that develop with age.

While this study examined the learning of older computer users in general, other specific factors should be examined in future research: categories of ages, mental and physical health, educational background, socio-economic status, interests, access to computers, current living situation, previous computer experience, specific types of tasks, etc. The subjects in this study had a minimum of a high school education and were healthy overall, with no major cognitive, visual, or motor disabilities, but all used corrective lenses. With this being said, perhaps less educated subjects with more mental or physical challenges would generate contrastive outcomes. In order to sufficiently reach out to the older generation, further studies focusing on specific factors related to this demographic and their learning must be conducted.

Conclusion

Designing instruction to foster learning is a priority and challenge for all educators. This research study concurs with previous research that multimedia, such as video, can enhance information and cognitive processing if the products are designed and executed effectively (Lin & Hsieh, 2006; Wright & Belt, 2001). When designing a module for senior citizens, specific accommodations must be integrated within the instruction due to the natural changes that occur with aging. In addition, video can be convenient and cost-effective; learners can quickly locate specific concepts with relative ease and avoid paper clutter.

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